

Columbia River Highway Bridges
Spanning various creeks along the Columbia River Highway
Portland and The Dalles vicinities
Multnomah and Wasco Counties
Oregon

HAER OR-56

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HISTORIC AMERICAN ENGINEERING RECORD

COLUMBIA RIVER HIGHWAY BRIDGES HAER OR-56

Location: Spanning various crossings along the Columbia River Highway, between Portland and The Dalles, Multnomah and Wasco Counties, Oregon

Dates of Construction: 1913-1921

Highway Engineers: Samuel Hill, Samuel Lancaster, Henry Bowlby, C.H. Purcell, K.P. Billner, L.W. Metzger, Conde B. McCullough

Builders: State of Oregon

Owner: Oregon Department of Transportation

Use: Vehicular and pedestrian bridges along a scenic highway

Significance: The idea of building a scenic highway along the south bank of the Columbia River was conceived by Samuel Hill and other prominent Portland businessmen. Hill took Samuel Lancaster and future State Highway Engineer, Henry Bowlby, to Paris and the Rhine River Valley of Germany to analyze highway development in Europe. With the establishment of the Oregon State Highway Department in 1913, Sam Lancaster was hired to oversee all preliminary engineering proposals and designs prior to pavement construction. State Bridge Engineers C.H. Purcell, K.P. Billner and L.W. Metzger created the innovative bridge designs that were constructed between Troutdale and Eagle Creek. Topographical and scenic values of the gorge were important factors in determining the bridge designs and locations. The Columbia River Highway was the first scenic highway constructed in the United States.

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The typical method of travel in the Oregon country in the 1830s was by canoe in the waterways, by horseback in the valleys and open country, and on foot through the mountains and other forested areas. Indians and trappers established trails throughout the region, and these were later broadened into roads when westward migrations began. Eventually, the primary trails became collectively known as the Oregon Trail. Thousands of ox-drawn wagons eventually established a main travel route from the lower Missouri River to the Willamette Valley. The Oregon Trail ended at Oregon City. The early trail ended at The Dalles, and the remainder of the journey west was down the treacherous Columbia River.

West of The Dalles, the river provided the only means of transportation until 1846, when Samuel Barlow and Joel Palmer cut a crude wagon road, the Barlow Trail, through the forests and over the high slopes of Mount Hood to the Willamette Falls at Oregon City. During this period short stretches of primitive roads were also constructed between adjacent settlements not connected by waterways. Demands for adequate mail service helped to hasten the transformation of trails into vehicular roadways.

The Hudson Bay Company controlled freight movement on the Columbia in the early part of the nineteenth century. Early settlers and their belongings rafted down the river. There were few steamboats in Oregon prior to 1850. The riverboat Columbia (1850) transported passengers and goods between Astoria and Oregon City. Service was supplemented with the launching of the Lot Whitcomb at Milwaukie, near Portland.

Wagon wheels were still creaking over the mountain passes when promoters in the Northwest began to organize railroad companies. In the late 1850s, Joseph S. Ruckel and Harrison Olmstead established the first rail service in Oregon. In the summer of 1859 four and a half miles of wooden track were laid between Bonneville and the Cascade Locks. Mules and horses pulled trains of four or five small cars. Soon after this stretch of railroad was laid the wooden rails were covered with sheet iron and the Oregon Pony, the first steam locomotive to be built on the Pacific coast, began transporting freight and passengers both ways past the Cascades.

The Union Transportation Company was reorganized as the Oregon Steam Navigation Company in 1859. It had begun operations with eight small river boats and eventually acquired the portage railroad at the Cascades and another between The Dalles and the mouth of the Deschutes River.

Henry Villard, German-American railroad tycoon, did much to develop the railroad in Oregon. After completing a north-south railroad to California he acquired the Oregon Steam Navigation Company, which controlled traffic on the Columbia River for many years. Villard reorganized the company as the Oregon Railway and Navigation Company and began building a railroad on the Oregon bank of the Columbia. After its completion in 1882, Oregon finally had its commercial outlets to the East and California.

On October 23, 1872 the state legislature of Oregon appropriated \$50,000 for construction of a wagon road from the mouth of the Sandy River to The Dalles, along the south shore of the Columbia River. The state appropriated another \$50,000 in 1876 to complete construction of this crooked and narrow trail with steep grades. This was the beginning of the Columbia River Highway.

Oregon took its first decisive step to improve roads in November of 1910. Oregon adopted a constitutional amendment granting the power to counties of the state to issue bonds for the construction of permanent roads. In the same year, Henry Wemme and others petitioned the authorities of Multnomah County to construct a road from the town of Bridal Veil, east to the Hood River county line. In January, 1911, the "Oregon Good Roads Association" inaugurated a state-wide movement to secure support for five highway measures that were submitted to the legislature, and appointed a general "Good Roads Committee," with two members from every county. Thus the era of the good roads movement was launched in Oregon, and the slogan of

advocates became, "Let's Pull Oregon Out Of The Mud."¹

During the closing decade of the nineteenth century the Pacific Northwest was rapidly shedding its frontier status. An important step in this process was the development of transportation systems that connected the Northwest with the rest of the nation. The increasing importance of the automobile fostered state, national, and international good roads movements that provided the impetus for the formation of a national highway system.

The trend toward a civilized wilderness developed rapidly in the turn-of-the-century Pacific Northwest. Eastern institutions were established in a period when mass production was a new boon to American industry. It was during this period that the United States emerged as an industrialized nation. Road-building in the east followed the progress of industry. Prior to the turn of the century, federal funding for road construction was minimal, or non-existent. The Pacific Northwest became civilized with the completion of the northern transcontinental railroad in 1883. From 1900 to 1920, there was a dramatic population shift from the country to the city. In Portland, Oregon, the population doubled after the successful Lewis and Clark Exposition of 1905. This exposition helped to advertise the economic potential of Oregon and encouraged the development of Portland.

The mass production of the bicycle in the 1890s brought about a bicycle boom that carried over to the auto industry in the early 1900s. The popularity of the bicycle became the catalyst to improve road conditions. The promotion of good roads really began with the League of American Wheelman (LAW). This organization was established in 1880 and consisted of bicycle manufacturers, dealers, and owners. The League of American Wheelman began publication of Good Roads magazine in 1892. They organized the National League for Good Roads at the 1893 Columbian Exposition in Chicago. As the automobile gained in popularity and importance the Good Roads Movement became a national crusade with political clout. "President Roosevelt gave an address entitled 'Good Roads as an Element in National Greatness' to the National Good Roads Convention at St. Louis in 1903."² The railroads supported good roads as a vehicle to bring people and goods closer to their numerous stops and lines.

A new trend that was gaining favor with the American middle class was the legitimacy and desirability of leisure time. This trend affected residents of the Northwest, and an attitude of national pride developed as newly developing technologies and ideas were blended into mainstream society. Increased leisure time, along with comfortable and faster transportation systems, added to the appeal of tourism in Oregon. Developing tourism, combined with the need to help farmers move produce from rural to metropolitan centers, inaugurated the idea of an effective Oregon road system that connected with the national road system.

In Oregon, transportation for the farmer was desperately needed because goods were transported to market on wagon and toll roads over treacherous mountain passes. In the 1890s few engineers were trained in highway construction but with the growing interest in road reform, a new technology began to develop. By 1900 the National Good Roads Association was established, and in 1901 International Good Roads Congresses encouraged the study of European highway systems.³

When Samuel Hill first traveled over Washington's roads he decided that he was going to introduce a Good Roads Association that would ultimately improve transportation in the Northwest. All across the country conventions for the promotion of good roads were taking place in response to cultural and technological changes that were occurring in American society. Samuel Hill, wealthy railroad executive, lawyer and banker, became an active participant in both the national and international good roads movements. He studied road building in Belgium and England. He worked with international good roads enthusiasts King Albert of Belgium and Britain's Lord Kitchener. Hill developed a long-standing friendship with King Albert from this experience.

Samuel Hill was born in North Carolina in 1857. His father was a country physician, banker and cotton industrialist who advocated the building of plank roads in North Carolina. Because of his Quaker stand on abolition, Hill's father became involved with the underground railroad and, when the Civil War threatened, fled to Minneapolis, Minnesota. By 1867 both of Samuel Hill's parents had died, leaving the six children parentless.

Samuel Hill worked many jobs including geological surveys. He received a law degree from Harvard University in 1879. He practiced law in Minneapolis with the firm of Jackson, Atwater and Hill. Hill was always civic and politically oriented. Samuel Hill loved to travel and over the years became friends with many influential Europeans.

Through his law practice Samuel Hill became acquainted with James Jerome Hill, president of the Great Northern Railway. Jim Hill was one of the most powerful men in the transportation business at the end of the nineteenth century. Sam Hill married Mary Hill, Jim's eldest daughter, in 1888. Samuel and Jim Hill shared similar philosophies and agreed that "the advancement of civilization would depend on transportation facilities."⁴ In 1888 Sam Hill became interested in banking and organized the Minneapolis Trust Company, which later financed his investments in the Pacific Northwest.

Prior to the completion of the Great Northern Railroad, Portland, Oregon, was the principal metropolitan center of the Pacific Northwest. Seattle was still undeveloped and Hill thought it a good place for him to begin his enterprises. Hill's railroad and financial interests brought him to Seattle. Here Samuel Hill invested in the Seattle Gas & Light Company after the completion of the transcontinental railroad to Seattle in 1893. By 1903 Samuel Hill was settled permanently in Seattle.

Sam Hill wished to "civilize" the West in the image of Europe. His numerous trips abroad took him to the German Rhineland. He was inspired by the beauty of the scenery along the Rhine River, and realized that road building was an aesthetic undertaking as well as an engineering accomplishment. Hill brought Samuel C. Lancaster, aspiring young highway engineer to Seattle.

In 1899 Hill organized the first Good Roads convention for the state of Washington. The meeting was held in Spokane, Washington and was attended by fourteen advocates and supporters of good roads in Washington. The Pacific Northwest's coming of age was linked to the growing popularity of the automobile and the surging spirit of a rapidly growing nation. These men realized that the economic development of the region was dependent on improved roads. In later years the railroad would recognize the economic threat of the automobile. But for now the railroad was satisfied to support the good roads movement because they could realize direct financial benefits.⁵

Hill served as president of the Washington Good Roads Association from its inception in 1899 until 1910. In 1907 the National Grange joined the good roads movement and supported the use of federal and state monies to build better roads across the country. With the eventual support of the farmer the good roads movement was destined to succeed. Hill also promoted the scenic beauty of the Pacific Northwest because he knew revenue from tourism ultimately benefited the individual states. Samuel Hill fully realized that the support of the old frontier society and the new progressive society that was emerging at the turn of the century were essential to the success of a national system of good roads.

During this early highway development period in Washington Hill brought two highway engineers to the Northwest whose expertise and dedication played an important role in the development of the region. These men were Samuel Christopher Lancaster and Major Henry L. Bowlby.

Henry Bowlby was educated at West Point, and began his career on a railroad survey in South America. He was a specialist in mathematics who went on to become a professor at the University of Nebraska. Samuel Hill brought him to Seattle where he taught at the University of

Washington. Bowlby was appointed Highway Commissioner for the state of Washington in 1909.⁶

Samuel Lancaster (1864-1941) was born at Magnolia, Mississippi. He grew up in Jackson, Tennessee and worked as a construction engineer for the Illinois Central Railroad before an attack of infantile paralysis, combined with malaria, exposure and overwork, forced him to quit at age 22. After a miraculous recovery, he began work as city engineer in Tennessee. In 1904 Lancaster began experimentation with hard-surfaced roads and became consulting engineer with the Bureau of Public Roads. Hill met Lancaster in 1906 and encouraged him to settle in Seattle. In Seattle, Lancaster became consulting engineer to the parks department and worked with city engineer, R.H. Thomson.⁷ In preparation for the Alaska-Yukon-Pacific Exposition, Thomson and Lancaster worked on the boulevard system designed by the Olmsted Brothers of Brookline, Massachusetts. In 1909, Lancaster became one of the first instructors in highway engineering at the University of Washington.

To better understand road issues and prepare for a road conference in the Northwest, Hill, Lancaster, Bowlby and Thomson attended an International Road Congress in Paris. This trip, taken at Hill's expense, extended to several European countries to study roads and their improvements. Some of the goals of this conference were to establish standard specifications for highway construction. Papers were presented on Asphalt Macadam Roadways; Fences, Hedges and Shade Trees; and Modern Roadway Bridges. Lancaster was particularly impressed with the German Rhine River scenery. This area possessed steep and rugged slopes and resembled the topography of the Columbia River gorge, however it was more settled and developed as an agricultural area. Numerous castles and ancient structures were located along the Rhine and Samuel Hill hoped to construct a magnificent home for himself at Maryhill.

In 1910 Hill resigned as president of the Washington State Good Roads Association. He later became president of the Pacific Highway Association and the American Road Builders Association, as well as vice president of the International Road Congress. These later two organizations advocated construction of 50,000 miles of interstate highways.

By the end of 1910 Hill's influence had permeated the Good Roads Movement. His knowledge of the latest technological advances, his visionary outlook, his money, connections, and dramatic lobbying efforts all helped him to become a leading promotional force in many of the road building associations, both national and international.

Sam Hill and Samuel Lancaster believed that scenic beauty, fertile soil and natural resources, when harnessed efficiently, could raise agricultural production and tourism for the nation, much as the Rhineland had done for Germany.⁸ Hill's numerous trips to Europe allowed him to study the industry and agriculture of densely populated areas and to analyze German methods of land-use planning. Hill was greatly impressed by the neatly-trimmed European landscapes.

Germany's Rhine River cuts through the countryside in a manner similar to the way the Columbia River cuts through the Pacific Northwest. Because of denser populations near the Rhine, an unbroken line of villages and farmland developed along both banks of the river. The high precipices were dotted with medieval castles, which lent a protective, secure feeling to the surrounding countryside. This bucolic scenery, combining both industry and beauty, pleased Hill's aesthetic sense. Hill believed the Columbia River basin had more scenic and economic potential than the Rhine.

National road systems had been developed in Europe long before the advent of the automobile. Hill believed that motorized vehicles and highways were the key to growth in the Northwest. A system of good roads was essential in establishing the Northwest as an important industrial center and agricultural region.

In 1907 Sam Hill purchased 6,000 acres of foothills overlooking the Columbia River 100 miles east of Portland, on the north shore of the river. In 1914 Hill commissioned Hornblower

and Marshall, a Washington D.C. architectural firm, to design his renaissance revival-style residence. A variety of circumstances slowed the completion of this estate, which was named Maryhill. It was here that Hill experimented with road paving and launched his campaign for good roads. It was Hill's dream to demonstrate that roads could be more than utilitarian, functional routes. They could be aesthetic and historical, and could offer amenities like restaurants, auto camps and filling stations.

In 1911, Hill built seven miles of experimental roads at Maryhill. Samuel Lancaster and Henry Bowlby attempted to use every method of road building and paving in use at the time on Hill's experiment. In addition to concrete they experimented with macadam, asphalt macadam, crushed rock macadam treated with oil, sand and gravel macadam, and decomposed rock macadam. Innovations were used with drainage gutters and grading.

The ultimate goal of Samuel Hill's good road vision was to build a state highway through the Columbia River gorge that would become part of the national highway system. Part of his goal was to provide a route that would bring people to view the grandeur of his enterprise at Maryhill. With the failure of the gorge highway in Washington Hill switched his lobbying efforts to the Oregon legislature.

By 1913 the Good Roads Movement had shifted its emphasis from rural lines to transcontinental highways. The early motorists were mainly wealthy businessmen who were willing to tackle the many obstacles of transcontinental highway development.⁹ In 1915, the year of the Panama-Pacific Exposition, boosters of national highway development envisioned a nation covered with transcontinental highways. California was one of the first states in the nation to adopt a state aid bill for roads in 1895. Washington formed a highway commission in 1905. Oregon was slow to adopt the national "Good Roads" attitude and would not establish a state highway department until 1913. Advocates of good roads, mostly wealthy Portland businessmen like Simon Benson, John Yeon, Rufus Holman, Julius Meier and Amos Benson, began working towards a road commission in 1907.

In 1909 the Portland Auto Club made an assessment of the road situation in Oregon and found it to be deplorable. Oregon good road advocates wished to see transportation routes developed along the Columbia and Willamette rivers. There was great interest in the Columbia River Highway for a number of reasons. First, the river cut through the Cascades low enough to make the route accessible year round. Second, such a route would be a direct connection with the eastern part of the state and would connect to Portland and on to the Pacific Ocean. Third, the Columbia was one of the most scenic attractions in the state of Oregon, and by developing a road along its route tourism would benefit.

In 1912 Simon Benson gave Governor Oswald West \$10,000 to build a road around Shell Rock Mountain, which was built with convict labor. Under the leadership of Governor Oswald West (1911-1915) a road bill passed to insure state bonds up to two percent of the assessed valuation of the state for the construction of permanent state roads. The remainder of the 1912 roads legislation was defeated. This would have allowed unlimited power to issue bonds for road improvement and development and created a state highway department and a state road board.

These defeats frustrated the ambitious ideas of the Portland good roads advocates, however it was through the leadership and the lobbying efforts of Samuel Hill that road legislation was finally passed that allowed construction of the Columbia River Highway.

Samuel Hill became a member of the Portland business elite in 1910 when he invested in the Home Telephone and Telegraph Company with such prominent businessmen as William M. Ladd, Henry and Elliot Corbett, Theodore Wilcox, and A.L. Mills. In 1913 Hill began his Good Roads program in Oregon. He believed that if the Columbia River Highway could be built to connect with the Pacific Highway in time for the Panama-Pacific Exposition in San Francisco, the results could mean tremendous growth and economic development for Oregon. Hill explained to

the legislators on February 9, 1913, "The Pacific slope has greater areas for the tourist, pleasure-seeker and man in need of wholesome recreation than has the Old World."¹⁰ After conducting a tour for prominent Portlanders and legislators of road improvements at Maryhill, Samuel Hill appeared at the Oregon legislature with Frank Terrace, Henry Bowlby, Samuel Lancaster and Charles Purcell, to lobby for the construction of the Columbia River Highway. These men lobbied for a state highway commission and a state system of unified roads. After a presentation with lantern slides and charts they presented convincing arguments that farming and tourism would generate many new services and revenues for the state of Oregon, if adequate roads were provided. Hill compared the Pacific Northwest to Switzerland and the Columbia River to the German Rhine. Hill believed the advantages of the tourist-luring European highways could be re-created in Oregon. He stated, "We will cash in year after year, on our crop of scenic beauty without depleting it."¹¹ Additional benefits of better roads in rural areas would improve schools, make telephones more accessible, and increase rural free mail delivery. The Pan-American Highway was being promoted as well as the Columbia River Highway during the 1913 legislative session. Both of these highways could be used for protection in case of foreign attack on the United States. Military protection was the final influence that swayed the legislators.

The first Oregon Highway Commission was established in 1913, with participation by every county in the state. This commission included Governor Oswald West, chairman; Secretary of State Ben W. Olcott, and State Treasurer Thomas B. Kay.¹² This commission allowed Samuel Hill to bring his highway experts into the newly formed system. Henry Bowlby became Oregon's first state highway engineer. Samuel Lancaster became the highway engineer for Multnomah county as well as consulting engineer for the Columbia River Highway. Charles Purcell became the principal bridge engineer and Sam Hill was a member of the highway board for the Columbia River Highway. The Columbia River Highway became a venture in craftsmanship and progressive technology that was to put Oregon in the forefront of the race for a national highway system.

Ground was broken for construction of the Columbia Highway in the fall of 1913. John Yeon, millionaire, lumberman and realtor, donated two years of his time as county roadmaster, and organized and directed the work of the day laborers. Amos Benson was his assistant during this period. The scenic wonders of the gorge were complemented by fine craftsmanship and creative designs of the highway structures. The highway was constructed with a maximum grade of 5 percent, with widths of no less than 24' (18-foot road and two 3-foot shoulders) and minimum curve radius of 100'.

The stretch of road from the Sandy River to Hood River was the showpiece of the highway. The beautiful waterfalls and overlooks were complemented by Lancaster's highway and structural designs. Costs for this stretch of road included an initial \$750,000 given by Multnomah county with a voted bond of \$1,250,000 for paving. It was ultimately paved with Warrenite, an asphalt bound macadam or asphalt concrete, at a cost of approximately \$15,000 per mile. There was no state or federal aid in the construction of this highway.¹³ The highway extended from Hood River to Astoria by the summer of 1915.

Seventeen bridges and viaducts with a total length of 3,699' were built to enhance the scenic beauty of this stretch of highway. The bridges illustrate the fusion of the utilitarian and the aesthetic. Each bridge was unique to the site situation and incorporated technological innovations that were just becoming understood during this period. Italian stone masons crafted the dry-masonry retaining walls, which were built of native stone and blended with the rocky hillsides that they were excavated from.

Latourell Creek bridge was the first bridge constructed on the highway. It was designed by K.P. Billner, under the direction of state bridge engineer C.H. Purcell. The bridge is a three-span reinforced concrete braced spandrel deck arch. The braced spandrel framing is usually

found only in steel deck arch construction, and is unique to this structure. At the time of its construction it was one of the lightest concrete bridges, relative to its dimensions, in the country. This bridge established the essential form of the concrete arch that would be used in Oregon and other sections of the United States.

Shepperd's Dell bridge was the second bridge on the highway designed by K.P. Billner. This bridge is a reinforced concrete deck arch with a 100-foot span. The solid curtain wall between spandrel columns and above the crown of the parabolic arch was a unique feature for the period. This was one of the strongest and best erected bridges on the highway. Later concrete arch bridges on the highway, and elsewhere in Oregon, of state bridge engineer Conde B. McCullough's imitate the form and detail of this bridge.

The Moffett Creek bridge, 1915, is another significant bridge design on the Columbia River Highway. It was designed by L.W. Metzger and is a low rise reinforced concrete deck arch with a clear span of 170' and rises only 17' in that distance. When it was constructed it was the longest three-hinged flat arch bridge in the United States. The hinges were cast iron with steel rollers.

These three bridges were technological achievements in their day and were designed for functional uses. They balance utility with aesthetics. Judging by the way these bridges have stood the tests of time we can be satisfied from the fact of their undamaged condition that the technological solutions are correct and at the same time have proved themselves economical. Economy in construction was a major goal of these early bridge engineers, as they would be with later bridge engineers. These early bridges incorporated new technologies of the day, including influences from European road and bridge construction. They were designed to fit their setting, and in craftsmanship, were works of art. Historian Carl Condit believes the Oregon State Highway Department played a leading role in the development of American concrete bridges, with their earliest contributions on the Columbia River Highway.

After the outbreak of World War I, Samuel Hill left for Europe to work for the Red Cross. In 1916 he traveled to Russia to advise on the construction of the trans-Siberian railroad. Oregon's efforts for a centralized highway commission left responsibility with the individual counties until 1917. At that time the state began planning and promoting highway development for defense purposes. Additionally, in 1916 the first Federal Road Aid bill allocated money to each state to improve rural roads. Federal funding for roads, mass production of affordable automobiles, and the rising influence of the American middle class, due to the politics of the Progressive era, climaxed a unique cultural period.

After World War I a highway like this would never have been built. The interest in craftsmanship diminished because of rising labor prices and environmental and artistic concerns were forced to accommodate greater loads and faster speeds. Highway construction became financed at the public expense. This was the era when construction materials became mass produced and designs became standardized. The Columbia River Highway became an example of technological experimentation of the early twentieth century with the classic formality of the late nineteenth century.

Hill died enroute to highway hearings in Salem, Oregon, on February 26, 1931. Samuel Hill was an experimenter and promoter, fitting into the progressive spirit of the period in the "modernization" sense of Samuel P. Hays, with his promotion of standardized road systems, scientific planning, and expertise in highway engineering.¹⁴

The early work of the state highway department was financed by a state tax levy of one fourth mill which was expected to raise approximately \$250,000 per year. The first Oregon road law had not been entirely satisfactory to Governor West because it lacked some key components. The state highway engineer, Henry Bowlby, urged the commission to allow his department to obtain right-of-way by condemnation. Bowlby wanted the jurisdiction over roads granted to the

State Highway Commission, including the right to grant franchises.

Henry Bowlby served as highway engineer until March 31, 1915. The legislature of 1915 placed the duties of road construction on the state engineer, who was an elective official responsible for water resources and irrigation. Bowlby was attacked for inefficiency and charged with squandering state highway funds. Considering the rapid development of the Columbia River Highway, it appears that Bowlby accomplished a great deal with the limited resources and difficult conditions that he was faced with in the first years of the Oregon State Highway Department. Bowlby's unpopularity with the farmers and state grange were greatly responsible for his dismissal.

This change in highway commission authority resulted in more or less chaos in state highway affairs, and the years 1915 and 1916 went by with comparatively small accomplishments. The work begun in 1913 and 1914 was carried to completion, and a limited amount of additional work was undertaken in the counties. No expansion in highway department organization occurred during this period.¹⁵

Little highway work was accomplished until February, 1917, when Governor Withycombe signed the State Highway Commission Measure. This measure established a three man commission consisting of Simon Benson, chairman; Pendleton banker W.L. Thompson; and Eugene real estate agent E.J. Adams. After Adams' short term expired lumberman Robert A. Booth joined the commission. The commission appointed its own chairman as well as a chief counsel, a secretary, an auditor, a state highway engineer, and one or more assistants.

One of the first duties of the commission was to hire Herbert Nunn as state highway engineer. Nunn was experienced in all branches of road building and paving. He had been employed with state highway work in New York City and El Paso, Texas. He was known for his efficiency and ability to inspire and manage people. Soon after he began work for Oregon he showed that he was familiar with dirt-road construction, macadam-road construction, grading work, bridge work, culvert work and paving. "He had the faculty of enthusing the men with whom he worked and dealt, so they threw every atom of energy into what they were doing."¹⁶ Nunn straightened out right-of-way tangles and maintained a sense of flexibility with his peers that insured high quality, innovative work for the Oregon State Highway Department.

In 1916, the United States Congress enacted a law making available \$85,000,000 for co-operation with the states in the construction and improvement of roads. Of this amount Oregon received \$1,819,280 for cooperative work which would not exceed 50 percent of a projects cost. The Oregon State Legislature passed a bill in 1917 accepting the terms of the federal governments cooperative offer. The highway department adopted the policy of matching the government funds with equal amounts from state funds only. County funds were used to increase the total amounts available rather than to reduce the amount of state cooperation.¹⁷

With financial arrangements secured for highway construction Herbert Nunn threw the state highway department into its work. He explained:

In order to anticipate the large amount of construction for 1919, the state highway department has worked a rather large engineering force throughout the summer of 1918 and will continue it through the winter of 1918 and 1919. This preliminary work is absolutely necessary in order to award contracts early in the spring of 1919. The federal government work requires very carefully prepared plans and estimates for all future government work and this has been anticipated also, and practically every project has been completed as to engineering features and submitted to the federal government for approval.¹⁸

The period 1917-1918 had been a difficult time for highway construction work. Labor

and materials were difficult to secure, wages and prices were unusually high and inadequate transportation facilities interfered with highway progress. Because the United States was in the throes of World War I the highway department was not able to accomplish as much work as they could have in peaceful times. In addition to their work with paving, macadamizing and grading, the highway department managed to prepare designs for forty-two bridges for various county authorities.

The Third Biennial Report of the Oregon State Highway Commission reveals that the roads of Multnomah county saw some of the heaviest grading and construction work in the state. Work included hard surfacing and laying of macadam, drainage and grading work, bridge construction and engineering work.

Between the years 1919 and 1920 the highway department experienced a shortage of labor, particularly labor skilled in highway work. They had difficulty securing road construction equipment, material prices were high, and contractors had difficulty obtaining financing for their work. An increased work load made it difficult for the engineering department to finish all of its jobs within the generally accepted time frames. To handle the increased work load of the department the office space and personnel were expanded. Division offices were established at key-points throughout the state. A testing laboratory was established at Salem for the purpose of testing road building materials and pavement. The first blueprint room was outfitted in the Capitol Building. With the additions of personnel Conde B. McCullough was appointed bridge engineer for the state. Under his direction the work expanded rapidly and considerable favorable comment was made on the structures completed by him.¹⁹

Nunn offered McCullough the position of State Bridge Engineer in the spring of 1919. McCullough accepted the position and brought with him his expertise in bridge construction. McCullough believed that aesthetics were an important aspect of bridge design, as well as economy of construction. The reinforced concrete arch became one of McCullough's favorite bridge types because of its simplicity, its engineering qualities, and its low maintenance costs. McCullough is credited with perfecting the use of concrete, reinforced with steel bars, in Oregon bridge construction since the 1920s.

The 1920 biennium ended with improvements to the Columbia River Highway from Astoria to Pendleton nearly completed. Along the highway's 340-mile length, 178 miles were paved and 123 miles had been surfaced with broken stone and gravel. Paved surfaces were 16' in width with 4 feet of broken stone laid on both shoulders. Grading for a large part of the highway through the Columbia gorge had been extremely costly because of the vertical rock walls and numerous chasms that were spanned. "The grading of this highway represents what is probably the most difficult and costly piece of highway construction yet undertaken in America."²⁰

In 1919-1920 the bridge section was kept busy preparing designs for 238 bridges having spans in excess of 18'. Additional designs were prepared for seventy-nine structures less than 18'. This work totaled \$4,850,000 worth of bridge construction in the state. Section III of the Columbia River Highway from Hood River to The Dalles involved heavy grading along the steep slopes and construction of the Mosier Twin Tunnels. Where the highway crosses Mosier Creek Conde B. McCullough designed his third deck arch bridge to cross above the creek. This bridge, completed in 1920, is very similar in design to the Shepperd's Dell bridge. Also in 1920 McCullough designed an ornate deck girder bridge to span Mill Creek, on the outskirts of The Dalles. This bridge is 124' long and has arched curtain walls which disguise the girders. There are pebble-dashed panels, which became one of McCullough's signatures. There are ornamental brackets and urn-shaped balustrades with posts and concrete caps. Construction of this bridge completed the Columbia River Highway to The Dalles.

McCullough designed his fourth arch span of 75' to cross Dry Canyon Creek, on the Columbia River Highway. Like many of his arch bridges the open spandrel columns terminate in

semicircular arched curtain walls. There are pebble-dashed panels in the curtain wall and main piers. The decorative treatment on this bridge leans toward the streamlined look of the Art Deco style, that McCullough would become known for in the designs of his Oregon Coast Highway bridges.

In Oregon the automobile and the Good Roads Movement grew up together. Unlike the national movement Oregonians needed little convincing for the need of better roads after the highway department was established in 1913. Oregon was very forward in its highway and bridge planning. Oregon instigated the 1-percent gasoline tax as a bold new plan for financing highway construction. Oregon's idea was emulated by states all over the country.

In 1917 the legislature applied the same principle of the user's tax when it levied license fees upon automobiles and required that the funds obtained be expended only for building and maintaining roads. The legislature of 1919 extended the principle by taxing fuel. By levying a tax upon each gallon of gasoline used by vehicles on the public highways, the legislature provided funds in an amount that not even the most optimistic advocates of state financing would have thought possible a scant five years before.²¹

Oregon faced the 1920s with confidence because they had provided for adequate funds and a comprehensive system of planning and control for the development of their highways and bridges.

It was the farsighted thinking of Sam Hill and Samuel Lancaster that fashioned this spectacular highway along the steep banks of the Columbia River gorge. Major General George W. Goethal, builder of the Panama Canal, passed over the Columbia River Highway between Portland and Cascade Locks on Wednesday, September 1, 1915. He said, "The Columbia River Highway is a splendid job of engineering, and absolutely without equal in America for scenic interest."²² In 1950-54 construction of a low, water-grade route eliminated sections of the Columbia River Highway, that interfered with this straight ribbon of concrete. Further encroachment came with the construction of I-80N (later renumbered I-84) in the 1960s. The Columbia River Highway District was listed on the National Register of Historic Places in 1983.

ENDNOTES

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8. Samuel Hill, "Poor Roads are the Costly Highways, Not Good Ones," Oregon Sunday Journal, June 12, 1913.
9. Earl Pomeroy, The Pacific Slope (New York: Alfred A. Knopf, 1965), p.360.
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